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PATENT  
Docket No. H1215/1556 PCT/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Application of  
Kluth et al.

Serial No. 08/702,625

Examiner: John M. Cooney

Filed: 08/23/1996

Art Unit: 1711

TITLE: FOAM PLASTIC FROM DISPOSABLE PRESSURIZED CONTAINERS

CERTIFICATE OF MAILING

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Mary Lynne Carlisle

Typed or printed name of certifier

APPEAL BRIEF TRANSMITTAL

Mail Stop Appeal Brief  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Appellants' brief, in triplicate, is transmitted herewith in accordance with 37 CFR 1.192.

The fee for this Appeal Brief is not required (fee paid in prior appeal in this application).

The Commissioner is hereby authorized to charge any deficiency in the required fee or to credit any overpayment to Deposit Account 01-1250.

Respectfully submitted,

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PATENT  
Docket No. H 1215/1556 PCT/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re: Application of Kluth et al.

Confirmation No. 6917

Serial No. 08/702,625

Examiner: J. Cooney

Filed: 8/23/96


Art Unit: 1711

Title: FOAM PLASTIC FROM DISPOSABLE PRESSURIZED CONTAINERS

CERTIFICATE OF MAILING

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BRIEF ON APPEAL

Mail Stop Appeal Brief  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Appellants herewith submit a Brief on Appeal from the EXAMINER'S FINAL REJECTION of claims 15-36 and 40-68, dated August 11, 2003.

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**REAL PARTY IN INTEREST**

The application is assigned to Henkel KGaA, TFP/Patentabteilung, D-40191  
Duesseldorf, Germany.

**RELATED APPEALS AND INTERFERENCES**

Appellants are not aware of any appeals or interferences, which will directly  
affect or be directly affected by or have a bearing on the Board's decision in the present  
appeal.

**STATUS OF CLAIMS**

Claims 15-36 and 40-68 are pending in the application. Claims 1-14, 37,38 and  
39 have been cancelled. All of the claims stand rejected under 35 U.S.C. § 103(a) over  
U.S. Patent 4,263,412, Pauls in view of CA-2, 084,698 and U.S. Patent 5,086,175,  
Minato et al. All of the pending claims are the subject of this appeal.

**STATUS OF AMENDMENTS**

All amendments which have previously been submitted in the application have  
been entered.

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### SUMMARY OF THE INVENTION

The invention is a system for forming a foamed plastic, uses for the foamed plastic, compositions for forming the foamed plastic, methods of use of the foamed plastic, foam compositions and a method for producing the system (page 1 of the application). The system of the invention provides considerably reduced emissions of diphenylmethane diisocyanate (monomer) during the processing (page 3 line 16-19).

The system of the invention provides a container, that within 24 hours after releasing the foam from the container, has a content of diisocyanate monomer of less than 5% by weight (page 9, line 13, claim 1) and preferably less 2% by weight (page 4 lines 13-16).

One solution for providing the container of the system with a low content of diisocyanate monomers is to provide a polymerizable composition which has a low content of diisocyanate monomers (page 4 lines 20, 21).

The result can also be achieved by the addition of a trimerization catalyst immediately before or after foaming or to add an OH containing compound to the composition remaining in the container after foaming (page 4 lines 24-28).

The composition necessarily contains at least one isocyanate prepolymer, at least one catalyst for the reaction of the isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer. In addition, other additives, for example, solvents, flame proofing agents, plasticizers, cell regulators, and anti-agers may be added.

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Within the context of the invention, an "isocyanate prepolymer" is an oligomer containing reactive NCO groups which is involved as a pre-adduct in the formation of the polymer. (page 5 line 4-6.). Preferred prepolymers are formed by the reaction of isophorone diisocyanate or 2,4-tolylene diisocyanatotrimethylolpropane (page 5, lines 25-30). Polymer MDI which has a functionality of more than 2.3 and preferably in the range of 2.4 to 2.7 is useful in the practice of the invention (page 9 line 6-9). The reactive isocyanate-containing compounds based on MDI are characterized by a diisocyanate content of less than 20% by weight preferably less than 5% by weight, an NCO functionality of 2.7 to 5, and an NCO content of 26.0 to 30.0% by weight (page 11 lines 13-29).

Other polyisocyanates and isocyanate prepolymers are characterized by an isocyanate monomer content of less than 3% by weight, an NCO functionality of 2 to 5 and an NCO content of 8 to 30% by weight (page 11 lines 22-28).

The pressurized containers of the system of the invention contain 50 to 90 and preferably 60 to 85% by weight of an isocyanate compound, 0.1 to 5% by weight of catalyst, 5 to 35 and preferably 10 to 25% by weight of a blowing agent and 0.1 to 5% and preferably 0.5 to 3% of a foam stabilizer and up to 20 and preferably 3 to 15% by weight of a plasticizer. (Page 11 line 26 thru page 13 line 2). The composition can contain optional materials such as flame proofing agents in the amount of 2 to 50% by weight; other optional additives in an amount of 0.1 to 3% by weight can be in the composition (page 13 lines 3-5).

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Examples 1 presents a composition containing isocyanate prepolymers formed by reaction of a cyclotrimer with ethylene glycol. Examples 2-9 present compositions containing cyclotrimers of isophorone diisocyanate and hexane diisocyanate. The formation of low diisocyanate content polymer methylenediphenylisocyanate (MDI) by removal of diisocyanate and monoisocyanate compositions from a mixture is shown (Example 10), and foaming compositions containing the polymer MDI (10a and 10b) and a comparative example (10c) are shown. The foaming compositions are single component foaming compositions.

### ISSUES

1. Does a reference which discloses a container for dispensing a foamed isocyanate composition containing more than 5% monomer, from which virtually all of the prepolymer is expelled, in combination with references which disclose an isocyanate prepolymer formed from a diisocyanate monomer and a polyhydroxy compound with a diisocyanate content below 2% by weight and an NCO group content above 8% by weight make the present invention obvious?

2. Does a combination of references which discloses a system for dispensing a foam containing more than 5% by weight diisocyanate monomer in combination with references which disclose isocyanate mixtures containing less than 5% by weight diisocyanate monomers used in non foamed applications make the invention obvious?

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3. Does a composition which cannot be used to make a foamed plastic, due to its being a solid at the dispensing temperature, in combination with Pauls, make the present invention obvious?

4. Is the combination of references proper?

#### GROUPING OF THE CLAIMS

The claims do not stand or fall together. Each claim must be considered individually.

#### ARGUMENT

The invention is a system for the production of plastic foam. The system comprises: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or polyisocyanate prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of plastic foam from the disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5% by weight, based on the residual contents of the emptied container. The system also can include a polyisocyanate or isocyanate prepolymer with a diisocyanate monomer content less than 3% by weight based on the prepolymer, an NCO functionality of 2 to 5, and an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa · s at 25°C.

The low content of diisocyanate monomer in the container after the foam has



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been expelled can be achieved as follows:

1. Using low diisocyanate monomer content prepolymer which must contain 8-30% by weight NCO groups.
2. Introducing a trimerization catalyst into the pressurized container immediately before or after the contents are released from the container.
3. Introducing an OH containing compound into the pressurized container immediately before or immediately after the contents are removed from the container.
4. Using a cyclotrimer with a low diisocyanate content as the prepolymer.
5. Using polymer MDI with a low diisocyanate content as the prepolymer.

The system of the invention comprises a disposable pressurized container containing a composition having an NCO content of from about 8 to 30% by weight, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer.

The polyisocyanate or polyisocyanate prepolymer must have an NCO content of from about 8 to about 30% by weight based on the weight of the prepolymer. The high NCO content is required to permit the foam composition to cure rapidly so that the foam does not collapse before the cell walls are stabilized to the required extent to support the foam.

The container must also contain at least one catalyst for the reaction of the isocyanate group with an OH group. This is required to permit the foam to polymerize at a rate sufficiently rapid to stabilize the walls of the foam cells before the foam

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collapses.

The system of the invention also requires the presence of a blowing agent to form the foam when the contents of the container under pressure are released.

The composition of the present invention must also contain a foam stabilizer, which provides a foam with the required cell size.

All of the components must be present in the composition for it to effectively function as a system for producing a foam. Other optional ingredients can be incorporated in the composition but the polyisocyanate or isocyanate prepolymer having an NCO content of from about 8 to about 30% by weight of the prepolymer, the catalyst, blowing agent and foam stabilizer are critical to the composition. Appellants submit that the prior art cited by the Examiner neither teaches nor suggests the present invention.

The claims stand rejected under 35 U.S.C. §103(a) as obvious over Pauls. (U.S. 4,263,412) in view of Schmalstieg et al. (CA 2084698; herein after noted as Canada) and Minato et al. (U.S. 5,086,175). Appellants respectfully submit that the references whether considered alone or in combination neither teach nor suggest the present invention.

Pauls is related to the prior art disclosed by applicants. Pauls discloses a system for dispensing one component polyurethane foam from a container in which the foaming components are separated by a flexible membrane from the propelling gas. The device has the advantage that only a small amount of the foaming agent is required. The small amount of foaming agent permits selection from a broader range of

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foaming agents since certain useful foaming agents are soluble to only a limited extent in one component systems. Pauls represents the prior art cited by applicants.

Pauls teaches that the components which react to form the isocyanate component of the mixture are introduced into the container and reacted therein (see examples 1 to 27, column 7 lines 54, 55 and column 8 lines 25-29). A less preferred method is to react the isocyanate forming components in a kettle and pack the reaction mixture from the kettle into the container. As is known in the prior art, since the ratio of NCO groups to OH groups is preferably from 4 to 8, the amount of unreacted diisocyanate monomer in the contents of the container is high (greater than 5% by weight of the isocyanate component).

The large amount of unreacted diisocyanate monomer in the contents of the Pauls container presents no problem; since at column 7, lines 61-65, Pauls teaches:

"The inner container (1), the special shape of which permits virtually complete expulsion of the foamable prepolymer mixture containing isocyanate groups, consists either of aluminum or a resilient plastic, e.g., high pressure polyethelene." (Emphasis added by appellants.)

Appellants submit that since the Pauls device permits virtually complete expulsion of the foamable prepolymer mixture containing diisocyanate monomer from the container, there is no incentive to reduce the content of diisocyanate monomer in the contents of the container to ease waste disposal. Since Pauls teaches that the

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preferred method of filling the container is by reacting the components in the container of the system or in a separate container then filling the system, which methods produce a foaming composition with a high concentration of diisocyanate monomer, applicants submit that Pauls is not concerned with the high concentration of monomer in the contents of the container since the container is virtually emptied due to its unique design and little monomer or prepolymer remains in the container after the foaming composition is expelled. There is no concern with a high monomer content in the foaming composition since little foaming composition remains in the container after use.

There is no suggestion in Pauls to use a low monomer content foaming composition or a composition which has a low monomer content after the system is used.

The deficiencies in the teaching of Pauls are not cured by combination with Canada and Minato et al. Canada and Minato et al. disclose isocyanate-containing compositions having a low content of diisocyanate monomers which are useful for lacquers and adhesives. As set forth in the references, Canada and Minato et al. teach that a prepolymer is prepared using an excess of the diisocyanate monomer and the excess unreacted diisocyanate monomer is removed from the reaction mixture by a distillation process. The amount of unreacted diisocyanate monomer in the composition can be less than 0.1% by weight of the composition (see Canada). However, the composition with the low content of unreacted diisocyanate is expensive to produce. One skilled in the art would have no incentive to include such an expensive

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material in the formulation used in the container of Pauls. The Pauls container permits virtually complete expulsion of the foamable prepolymer mixture and therefore the empty container does not present a disposal problem.

The Canada reference is not pertinent to the present invention. The Canada polyisocyanate is a solid material and would not produce an adequate foam and could be dispensed from the container only with difficulty. The isocyanate prepolymer or polymer must be a liquid material if the process of the present invention is to be operable. Appellants submit that the solid nature of the polyisocyanate of Canada would discourage its use in the system of the invention. The composition of Canada is specifically developed to be soluble in certain solvents to be useful as a lacquer or coating composition.

Nowhere in the teachings of Canada and Minato et al. is there any suggestion that the polyisocyanate would be useful in a foaming application. The Minato et al. composition was developed to be soluble in nonpolar solvents so that effective lacquer formulations could be made. The composition is particularly useful in a two package coating system. Canada discloses solid polyisocyanates which are useful in lacquer formulations. The polyisocyanates of Canada are generally dissolved in a solvent. Since it is preferred that the system of the present invention is a one component system and does not contain a solvent, Applicants submit that Canada neither teaches nor suggest the present invention.

As shown by the examples, the composition of Canada would not be useful as a

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one shot foaming material due to its long drying time (13 hours). In addition, since the prepolymers are solids, they would not be useful in the practice of the present invention.

Appellants submit that as disclosed in Canada and Minato et al., it is known in the art to prepare polyisocyanate containing compositions with a low content of diisocyanate monomer. However, these compositions are known for use in lacquers or adhesives. Lacquers and adhesives are relatively expensive materials which can afford the extra process steps in preparing the low diisocyanate monomer material. However, there would be no incentive for one skilled in the art to include the expensive low diisocyanate content material in a system for forming a foamed resin comprising the container of Pauls from which virtually all of the contents are expelled, to reduce the expense of disposing of the container.

Appellants respectfully submit that the rejection over the combination of Pauls in view of Canada and Minato et al. is improper. To formulate a rejection over a combination of references there must be some suggestion in the references to make the combination. As discussed above, the only suggestion to combine the teachings of the references is in the present application. Clearly, one skilled in the art would not be led to include a low diisocyanate monomer content prepolymer in the container of Pauls, since the single component foaming mixture is virtually completely expelled from the container and the empty container would not present a disposal problem. Appellants therefore submit that the rejection is improper and request that it be

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reversed.

Appellants have provided a novel and unobvious system for providing a plastic foam. The system has a major unrecognized advantage in disposal of the empty container. Applicants submit that the prior art cited by the examiner provides no teaching or suggestion of the system of the invention. Pauls teaches the known system for forming foams; Canada and Minato et al. discloses low monomer content materials used for coatings and adhesives. There is no suggestion or incentive to combine the teachings of the references.

The combination of Pauls with Canada and Minato et al. is deficient in teaching or suggesting that isocyanates or polymeric MDI be utilized as the polyisocyanate in a one component polyurethane foam forming system. There is no teaching or suggestion that isocyanates and polymeric MDI are suitable foaming agents for one component foam systems.

In view of the above, appellants submit that the present invention is neither taught nor suggested by the combination of Pauls, Canada and Minato et al. and request that the Examiner's rejection be reversed.

Appellants also submit that use of a low diisocyanate monomer content prepolymer is only one possible solution to the problem, provided by the system of the present invention.

Disposable containers for generating foam plastic are known. However, the prepolymers utilized in the known systems were formed by mixing a large excess of the

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diisocyanate with OH terminated diols in the container to form a useful prepolymer.

However, since the compositions require a large stoichiometric excess of the diisocyanate, the compositions contain high concentrations of unreacted diisocyanate monomer. The present invention provides a method for forming a system which provides for residues with low monomer content in the pressurized container after use. The container can be designed to introduce an isocyanate cyclotrimer catalyst into the composition immediately before, during or after the contents have been removed from the container or introducing a low molecular weight alcohol into the container after the foam producing contents have been expelled from the container. Trimerization catalyst or the alcohol provide reactions which remove the diisocyanate monomer from contents of the container.

Systems for producing foamed plastics from pressurized containers were well known at the time the present invention was made. However, the systems were not concerned with residual amounts of unreacted diisocyanates in the pressurized container. The systems all contained substantial amounts of unreacted diisocyanate monomer in the container or the container was designed to expel substantially the entire contents of pressurized container so that there was little or not diisocyanate monomer remaining in the pressurized container.

#### PATENTABILITY OF THE CLAIMS

Claim 15 is patentable over the combination of references since there is neither



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teaching nor suggestion of a disposable pressurized container for forming a foam containing a polyisocyanate or isocyanate prepolymer having an NCO content of from 8% to 30% by weight based on the prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, which contains less than 5% by weight of an isocyanate monomer one day after the container is emptied. The compositions disclosed in Pauls contain more than 5% by weight isocyanate monomer and the compositions of Canada and Minato et al. are not disclosed or suggested as useful for foams. There is no suggestion to combine the references.

Claim 16 is patentable over the combination of references since the combination of references neither teaches nor suggests the system of claim 15 wherein the residue has diisocyanate monomer content of less than 2% by weight based on the total contents of the container after use nor suggests that it would be useful to provide such a system.

Claim 17 is patentable over the combination of references since there is neither teaching nor suggestion of a composition comprising the isocyanate polymer or prepolymer, catalyst, blowing agent and foam stabilizer with a diisocyanate monomer content less than 2% by weight based on the total contents of the container before application of the composition. There is neither teaching or suggestion to combine the lacquer components of Canada or Minato et al. with the composition and container of Pauls.

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Claims 18, 19, 20 and 21 are patentable over the combination of references since there is neither teaching nor suggestion of a system as claimed in claim 15 containing isocyanate polymer or prepolymer having from 8 to 30% by weight of NCO groups, based on the weight of the prepolymer, and a diisocyanate monomer content within the ranges set forth in claims 18-21.

Claim 22 is not obvious over the combination of references since there is neither teaching nor suggestion of the system containing a polyisocyanate or isocyanate prepolymer with an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa · s at 25° centigrade produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and /or aromatic diisocyanates containing 8 to 20 carbon atoms and a diisocyanate monomer content of less than 3% by weight based on the prepolymer.

Claim 23 is patentable over the teachings of the combination of references since there is neither teaching nor suggestion of the system of the invention wherein the prepolymer with the low NCO content be a cyclotrimer of a diisocyanate. Isocyanates are known but until the present invention had not been applied to one shot foaming system.

Claim 24 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein the prepolymer is a cyclotrimer of hexamethylene diisocyanate, isophorone diisocyanate and mixed trimers

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of hexamethylene diisocyanate and isophorone diisocyanate. These isocyanates had never been applied to foaming systems before the present invention.

Claim 25 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein an isocyanate prepolymer is a prepolymer of diisocyanates or isocyanurates with polyols and containing from 8 to 30% by weight of the prepolymer of NCO groups.

Claim 26 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention containing a prepolymer containing from 8 to 30% by weight of NCO groups based on the weight of the prepolymer wherein the prepolymer is produced from diisocyanates with NCO groups differing in their reactivity.

Claim 27 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the present invention comprising a pressurized container containing from 50 to 90% by weight of at least one polyisocyanate or isocyanate prepolymer containing from 8 to 30% by weight of the prepolymer of NCO groups, 0.1 to 5% by weight of a catalyst for reaction of the isocyanate groups with OH groups, 5 to 35% by weight of a blowing agent and 0.1 to 5% by weight of a foam stabilizer which after the container is empty contains less than 5% by weight of the contents of the container of diisocyanate monomer.

Claim 28 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising a polyisocyanate or

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isocyanate prepolymer containing from 26 to 30% by weight based on the weight of the prepolymer of NCO groups, a functionality greater than 2.7 wherein the prepolymer is formed from technical MDI by removal of a portion of diisocyanatodiphenylmethane. MDI prepolymer had not been applied to one component foaming system before the present invention.

Claim 29 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising use of polymer MDI or a polymer MDI prepolymer with an NCO content of from 26 to 30% by weight of the prepolymer.

Claim 30 is patentable over the combination of references since there is neither teaching nor suggestion of the system claimed in claim 29 where the polymer MDI prepolymer is formed by reaction of MDI with a diol containing 2 to 6 carbon atoms.

Claim 31 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention whereby the system comprises polymer MDI or polymer MDI prepolymer having from 26 to 30% by weight of NCO groups wherein up to 50% by weight of the polymer MDI or polymer MDI prepolymer is replaced by at least one member selected from a group consisting of low-monomer NCO prepolymers of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms.

Claim 32 is patentable over the combination of references since there is neither

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teaching nor suggestion of the system of the invention for replacing a portion of the polymer MDI or polymer MDI prepolymer to produce moisture-curing foams differing in their hardness and elasticity.

Claim 33 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising the composition disclosed in claim 33 wherein the polymer MDI or polymer MDI prepolymer has an NCO content of from 26 to 30% by weight of the prepolymer.

Claim 34 is patentable over the combination of references since there is neither teaching nor suggestion of the one-component foam plastic produced by the system of the present invention.

Claim 35 is patentable over the combination of references since there is neither teaching nor suggestion of the one-component foam plastic of the system of the invention used as an insulating or assembly foam.

Claim 36 is patentable over the combination of references since the combination of references is silent concerning a one-component foam plastic formed in situ by the system of the invention.

Claim 40 is patentable over the combination of references since there is no teaching nor suggestion of a composition comprising at least one polyisocyanate or isocyanate prepolymer having an NCO content of from 8 to about 30% by weight based on the weight of the prepolymer, a catalyst for the reaction of the isocyanate group and an OH group, a blowing agent and a foam stabilizer and providing the residue in the

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spent container as claimed.

Claim 41 is patentable over the combination of references since there is neither teaching nor suggestion of the composition of Claim 40 having residue with a diisocyanate monomer content of less than 2% by weight based on the total weight of the contents of the container.

Claim 42 is patentable over the combination of references since there is neither teaching nor suggestion of a composition wherein the diisocyanate monomer content is less than 2% by weight based on the total contents of the container before its application and the isocyanate polymer or isocyanate polymer prepolymer contains from 8 to 30% by weight of NCO groups by weight of the prepolymer.

Claim 43 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for use in the system of the invention containing isocyanate polymer or isocyanate polymer prepolymer containing from 8 to 30% by weight of NCO groups in the composition having less than 1% by weight diisocyanate monomer based on the weight of the composition.

Claim 44 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for the system of the invention containing less than 1.0% by weight of diisocyanate monomer before the foam issues from the container.

Claim 45 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for use in the system of the invention

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comprising isocyanate polymers or isocyanate polymer prepolymers containing from 26 to 30% by weight of NCO groups, catalysts, foaming agents, foam stabilizers wherein the diisocyanate monomer content of the composition is less than 0.5% by weight.

Claim 46 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising a composition containing the catalyst, foaming agent, foam stabilizer and an isocyanate polymer or isocyanate prepolymer having from 8% to 30% by weight of NCO groups and less than 0.5% by weight of diisocyanate monomer, based on the total contents of the composition before application of composition from the disposable pressurized container.

Claim 47 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for forming a foam plastic from the disposable pressurized container system of the invention wherein the polyisocyanate or isocyanate prepolymer has a diisocyanate monomer content of less than 3% by weight based on the weight of the prepolymer, an NCO functionality of 2 to 5, NCO content of 8 to 30% by weight based on the weight of the prepolymer, a viscosity from 5 to 200 Pa · s at 25° centigrade wherein the prepolymer is produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and/or aromatic diisocyanates containing 8 to 20 carbon atoms each with a boiling point not higher than 180°C at 10 mbar.

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Claim 48 is patentable over the combination of references since there is neither teaching nor suggestion of use of an isocyanate prepolymer which is a cyclotrimer of a diisocyanate in the system of the invention.

Claim 49 is patentable over the combination of references since there is neither teaching nor suggestion of a composition wherein the isocyanate is a polymer selected from the group consisting of cyclotrimers of hexamethylene diisocyanate, cyclotrimers of isophorone diisocyanate and mixed trimers thereof for use in the system of the invention.

Claim 50 is patentable over the combination of references since there is neither teaching nor suggestion of the polymer isocyanate prepolymer formed from diisocyanate or polyisocyanate and polyols for use in the system of the invention.

Claim 51 is patentable over the combination of references since there is neither teaching nor suggestion for forming the isocyanate prepolymers from diisocyanates containing NCO groups with different reactivities to achieve a low diisocyanate monomer content for the system of the invention..

Claim 52 is patentable over the combination of references since there is neither teaching nor suggestion of the composition containing 50 to 90% by weight of the polyisocyanate or isocyanate prepolymer, 0.1 to 5% by weight of a catalyst, 5 to 35% by weight of blowing agent and 0.1 to 5% by weight of a foam stabilizer wherein the polyisocyanate or isocyanate prepolymer has an NCO content of from 8 to 30% by weight of the prepolymer for use in the system of the invention.



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Claim 53 is patentable over the combination of references since the references are completely silent concerning polyisocyanates or isocyanate prepolymer formed from polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight based on the polymer-MDI, an average NCO functionality greater than 2.7, an NCO content of 26 to 30% by weight based on the polymer-MDI with a viscosity of 5 to 2000 Pa · s at 25° centigrade a polymer-MDI obtained from technical MDI with an average functionality greater than 2.3 by removal of diisocyanatodiphenylmethane for use in the system of the invention.

Claim 54 is patentable over the combination of references since there is neither teaching nor suggestion of the composition wherein at least one polymer MDI or polymer-MDI prepolymer is a prepolymer formed from a polymer-MDI and a polyol for use in the system of the invention.

Claim 55 is patentable over the combination of references since there is neither teaching nor suggestion of the composition wherein the polyol is a diol containing 2 to 6 carbon atoms for use in the system of the invention.

Claim 56 is patentable over the combination of references since there is neither teaching nor suggestion of a polymer-MDI or polymer-MDI prepolymer containing at least one low-monomer NCO prepolymer comprising residues of at least one member selected from the group consisting of hexamethylene diisocyanate, tolylene-2,6-isocyanate, isophorone diisocyanate, diphenylmethane 4,4'-diisocyanate and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms for use in the

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system of the invention.

Claim 57 is patentable over the combination of references since there is neither teaching nor suggestion that replacing a portion of the polymer MDI or polymer MDI prepolymer produces moisture-curing foams differing in their hardness and elasticity.

Claim 58 is patentable over the combination of references since there is neither teaching nor suggestion of the composition of claim 58 wherein the polymer MDI or polymer MDI prepolymer contains from 26 to 30% by weight of NCO groups and the remaining components of the composition.

Claim 59 is patentable over the combination of references since there is neither teaching nor suggestion of cured foam plastic of the invention.

Claim 60 is patentable over the combination of references since there is neither teaching nor suggestion concerning foam plastics of the system of the invention and their possible use as an insulating or assembly material.

Claim 61 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention and one-component foamed plastic used in situ which has the composition set forth in claim 40.

Claim 62 is patentable over the combination of references since there is neither teaching nor suggestion of a two-component foam plastic obtained from the compositions claimed in claim 40 by reaction of the composition thereof and a polyol.

Claim 63 is patentable over the combination of references since there is neither teaching nor suggestion for using the two-component foam plastic of claim 62 as an

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insulating or assembly foam.

Claim 64 is patentable over the combination of references since the combination of references neither teaches nor suggests a two-component foam plastic used in situ formed from the composition of claim 40 for use in the system of the invention.

Claim 65 is patentable over the combination of references since there is neither teaching nor suggestion of a composition having an NCO group content of from 8 to 30% by weight and wherein the at least one polyisocyanate or isocyanate prepolymer with the low diisocyanate monomer content is obtained by distilling the diisocyanate monomer from the polyisocyanate or isocyanate prepolymer.

Claim 66 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein a trimerization catalyst is introduced into the composition in the container immediately before or after the foam is released from the container.

Claim 67 is patentable over the combination of references since there is neither teaching nor suggestion of the system of claim 15 wherein the diisocyanate monomers are reacted with an OH compound added to the composition in the disposable pressurized container after a foaming period.

Claim 68 is patentable over the combination of references since there is neither teaching nor suggestion of the system of claim 15 wherein a monohydroxy alcohol is added to the composition remaining in the disposable pressurized container of the system after the foam is released.

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Appellants respectfully submit that the claims in the present application are neither anticipated nor obvious over the teachings the combination of Pauls, Canada and Minato et al. whether they are considered alone or in combination since they neither teach nor suggest:

1. A system which comprises a pressurized container, a particular isocyanate polymer or isocyanate polymer prepolymer having from 8 to 30% by weight of NCO groups based on the weight of the prepolymer, a catalyst for a reaction with an OH compound, a foaming agent, and a foam stabilizer and having a diisocyanate monomer content less than 5% by weight of the contents of the container one day after the container is emptied.

2. An isocyanate polymer or isocyanate polymer prepolymer having an NCO content of 26 to 30% by weight of the prepolymer.

3. The system of the invention comprising prepolymers prepared from diisocyanate trimers or prepolymers prepared from the diisocyanate trimers having less than 5% by weight of diisocyanate monomer.

4. The system of the invention comprising polymer MDI or polymer MDI prepolymers as the foam forming material.

Appellants submit that a rejection of the claims in the present application based on the teachings of Pauls, Canada and Minato et al. is untenable and respectfully request that the Honorable Board of Appeals and Interference's reverse the Examiner.

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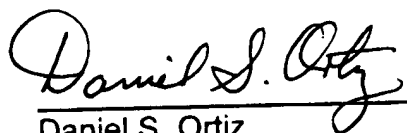
SUMMARY

Appellants respectfully request that the Examiner's final rejection be reversed for the following reasons:

1. The combination of Pauls in view of Canada and Minato et al. fails to teach or suggest the system of the invention.
2. The combination of Pauls in view of Canada and Minato et al. is improper since the only suggestion to combine the teaching of the references is in the present application.
3. The isocyanate product disclosed in Canada is not suitable for use as a material for forming a foam plastic since the isocyanate is a solid.

In view of the above discussion, Appellants respectfully request that the final rejection be reversed.

Respectfully submitted,



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APPENDIX

CLAIMS ON APPEAL

15. A system for the production of plastic foam comprising: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or isocyanate prepolymer having an NCO content of from about 8% to about 30% by weight based on the prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of the plastic foam from said disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5.0% by weight, based on the residual contents of the emptied container.
16. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight based on the total contents of the container.
17. The system as claimed in claim 16 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.
18. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight based on the total contents of the container.
19. The system as claimed in claim 18 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight based on the total contents of the container before its application from said disposable pressurized container.

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20. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight based on the total contents of the container.
21. The system as claimed in claim 20 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight based on the total contents of the container before application of the composition from said disposable pressurized container.
22. The system as claimed in claim 15 wherein said composition contains, before its application from said disposable pressurized container, as said at least one polyisocyanate or isocyanate prepolymer, at least one isocyanate prepolymer with a diisocyanate monomer content of less than 3.0% by weight, based on the prepolymer, an NCO functionality of 2 to 5, an NCO content of 8 to 30% by weight, based on the prepolymer, and a viscosity of 5 to 200 Pa · s at 25°C, as measured in accordance with DIN 53015, the prepolymer having been produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and aromatic diisocyanates containing 8 to 20 carbon atoms, each with a boiling point not higher than 180°C at 10 mbar.
23. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a cyclotrimer of a diisocyanate.
24. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a cyclotrimer of a mixture of hexamethylene diisocyanate, isophorone diisocyanate, and mixed trimers thereof.

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25. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a prepolymer of diisocyanates or isocyanurates containing NCO groups and polyols.

26. The system as claimed in claim 22 wherein said prepolymer has been produced from diisocyanates with NCO groups differing in their reactivity.

27. The system as claimed in claim 15 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polyisocyanate or isocyanate prepolymer,

0.1 to 5.0 % by weight of said catalyst,

5 to 35 % by weight of said blowing agent, and

0.1 to 5.0 % by weight of said foam stabilizer.

28. The system as claimed in claim 15 wherein said at least one polyisocyanate or isocyanate prepolymer is at least one polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight, based on the polymer-MDI, an average NCO functionality of greater than 2.7, an NCO content of 26.0 to 30.0% by weight, based on the polymer-MDI, and a viscosity of 5 to 2,000 Pa · s at 25°C according to DIN 53015, the polymer-MDI being obtained from technical MDI with an average functionality of greater than 2.3 by removal of a portion of the diisocyanatodiphenylmethane.

29. (Amended) The system as claimed in claim 28 wherein said at least one polymer-MDI or polymer-MDI prepolymer is a prepolymer of the polymer MDI and a polyol.

30. The system as claimed in claim 29 wherein said polyol is a diol containing 2 to 6 carbon atoms.

31. The system as claimed in claim 28 wherein up to 50% by weight of said at least one



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polymer-MDI or polymer-MDI prepolymer is replaced by at least one member selected from the group consisting of low-monomer NCO prepolymers of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate, and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms.

32. The system as claimed in claim 31 wherein said replacing produces moisture-curing foams differing in their hardness and elasticity.

33. The system as claimed in claim 28 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polymer-MDI or polymer-MDI prepolymer,

0.1 to 5.0 % by weight of the catalyst,

5 to 35 % by weight of the blowing agent, and

0.1 to 5.0 % by weight of the foam stabilizer.

34. A one-component foam plastic obtained from the system claimed in claim 15 by reaction of the composition thereof and moisture.

35. The method of using a one-component foam plastic as claimed in claim 34 wherein said one-component foam plastic is used as an insulating or assembly foam.

36. The method as claimed in claim 35 wherein said one-component foam plastic is used in situ.

40. A composition for the production of foam plastics from disposable pressurized containers comprising at least one polyisocyanate or isocyanate prepolymer having an NCO content of from about 8% to about 30% by weight based on the prepolymer, at least

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one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of the composition from said disposable pressurized container, the residue of said composition left in the pressurized container has a diisocyanate monomer content of less than 5.0% by weight, based on the residual contents of the emptied container.

41. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 2.0% by weight based on the total contents of the container.

42. The composition as claimed in claim 41 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.

43. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 1.0% by weight based on the total contents of the container.

44. The composition as claimed in claim 43 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.

45. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 0.5% by weight based on the total contents of the container.

46. The composition as claimed in claim 45 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.

47. The composition as claimed in claim 40 wherein said composition contains, before

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application from said disposable pressurized container, as said at least one polyisocyanate or isocyanate prepolymer, at least one isocyanate prepolymer with a diisocyanate monomer content of less than 3.0% by weight, based on the weight of the prepolymer, an NCO functionality of 2 to 5, an NCO content of 8 to 30% by weight, based on the weight of the prepolymer, and a viscosity of 5 to 200 Pa · s at 25°C, as measured in accordance with DIN 53015, the prepolymer having been produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and aromatic diisocyanates containing 8 to 20 carbon atoms, each with a boiling point not higher than 180°C at 10 mbar.

48. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is a cyclotrimer of a diisocyanate.

49. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is at least one isocyanate prepolymer selected from the group consisting of cyclotrimer of hexamethylene diisocyanate, cyclotrimer of isophorone diisocyanate, and mixed trimers thereof.

50. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is a prepolymer of at least one of diisocyanates and isocyanurates and polyols.

51. The composition as claimed in claim 47 wherein said prepolymer has been produced from diisocyanates with NCO groups differing in their reactivity.

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52. The composition as claimed in claim 40 wherein said composition is comprised of:

- 50 to 90 % by weight of said at least one polyisocyanate or isocyanate prepolymer,
- 0.1 to 5.0 % by weight of said catalyst,
- 5 to 35 % by weight of said blowing agent, and
- 0.1 to 5.0 % by weight of said foam stabilizer.

53. The composition as claimed in claim 40 wherein said at least one polyisocyanate or isocyanate prepolymer is at least one polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight, based on the polymer-MDI, an average NCO functionality of greater than 2.7, an NCO content of 26.0 to 30.0% by weight, based on the polymer-MDI, and a viscosity of 5 to 2,000 Pa · s at 25°C according to DIN 53015, the polymer-MDI being obtained from technical MDI with an average functionality of greater than 2.3 by removal of the diisocyanatodiphenylmethane.

54. The composition as claimed in claim 53 wherein said at least one polymer-MDI or polymer-MDI prepolymer is a prepolymer of the polymer MDI and a polyol.

55. The composition as claimed in claim 54 wherein said polyol is a diol containing 2 to 6 carbon atoms.

56. The composition as claimed in claim 53 wherein up to 50% by weight of said at least one polymer-MDI or polymer-MDI prepolymer is replaced by at least one low-monomer NCO prepolymer comprising residues of at least one member selected from the group consisting of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate, and cyclotrimers of aliphatic

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diisocyanates containing 4 to 14 carbon atoms.

57. The composition as claimed in claim 56 wherein said replacing produces moisture-curing foams differing in their hardness and elasticity.

58. The composition as claimed in claims 53 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polymer-MDI or polymer-MDI prepolymer,

0.1 to 5.0 % by weight of the catalyst,

5 to 35 % by weight of the blowing agent, and

0.1 to 5.0 % by weight of the foam stabilizer.

59. A one-component foam plastic obtained from the composition claimed in claim 40 by reaction of the composition thereof and moisture.

60. The method of using a one-component foam plastic as claimed in claim 59 wherein said one-component foam plastic is used as an insulating or assembly foam.

61. The method as claimed in claim 60 wherein said one-component foam plastic is used in situ.

62. A two-component foam plastic obtained from the composition claimed in claim 40 by reaction of the composition thereof as a first component and a polyol as a second component.

63. The method of using a two-component foam plastic as claimed in claim 62 wherein said two-component foam plastic is used as an insulating or assembly foam.

64. The method as claimed in claim 63 wherein said two-component foam plastic is used in situ.

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65. A method of producing the system as claimed in claim 15 wherein diisocyanate is distilled from said at least one polyisocyanate or isocyanate prepolymer.

66. A method of producing the system as claimed in claim 15 wherein diisocyanate monomers are polymerized by addition of trimerization catalysts immediately before or after foaming.

67. A method of producing the system as claimed in claim 15 wherein diisocyanate monomers are reacted with an OH compound added to the composition remaining in the disposable pressurized container after foaming.

68. The method as claimed in claim 67 wherein said OH compound is a monoalcohol.



PATENT  
Docket No. H 1215/1556 PCT/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re: Application of Kluth et al.

Confirmation No. 6917

Serial No. 08/702,625

Examiner: J. Cooney

Filed: 8/23/96

Art Unit: 1711

Title: FOAM PLASTIC FROM DISPOSABLE PRESSURIZED CONTAINERS

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the U.S. Postal Service as first class mail in an envelope addressed to: Commissioner for Patents, Alexandria, VA 22313-1450, on 2-3-04.

2-3-04

Date

Signature of certifier

Mary Lynne Carlisle

Typed or printed name of certifier

BRIEF ON APPEAL

Mail Stop Appeal Brief  
Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Appellants herewith submit a Brief on Appeal from the EXAMINER'S FINAL REJECTION of claims 15-36 and 40-68, dated August 11, 2003.

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**REAL PARTY IN INTEREST**

The application is assigned to Henkel KGaA, TFP/Patentabteilung, D-40191  
Duesseldorf, Germany.

**RELATED APPEALS AND INTERFERENCES**

Appellants are not aware of any appeals or interferences, which will directly  
affect or be directly affected by or have a bearing on the Board's decision in the present  
appeal.

**STATUS OF CLAIMS**

Claims 15-36 and 40-68 are pending in the application. Claims 1-14, 37,38 and  
39 have been cancelled. All of the claims stand rejected under 35 U.S.C. § 103(a) over  
U.S. Patent 4,263,412, Pauls in view of CA-2, 084,698 and U.S. Patent 5,086,175,  
Minato et al. All of the pending claims are the subject of this appeal.

**STATUS OF AMENDMENTS**

All amendments which have previously been submitted in the application have  
been entered.

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### SUMMARY OF THE INVENTION

The invention is a system for forming a foamed plastic, uses for the foamed plastic, compositions for forming the foamed plastic, methods of use of the foamed plastic, foam compositions and a method for producing the system (page 1 of the application). The system of the invention provides considerably reduced emissions of diphenylmethane diisocyanate (monomer) during the processing (page 3 line 16-19).

The system of the invention provides a container, that within 24 hours after releasing the foam from the container, has a content of diisocyanate monomer of less than 5% by weight (page 9, line 13, claim 1) and preferably less 2% by weight (page 4 lines 13-16).

One solution for providing the container of the system with a low content of diisocyanate monomers is to provide a polymerizable composition which has a low content of diisocyanate monomers (page 4 lines 20, 21).

The result can also be achieved by the addition of a trimerization catalyst immediately before or after foaming or to add an OH containing compound to the composition remaining in the container after foaming (page 4 lines 24-28).

The composition necessarily contains at least one isocyanate prepolymer, at least one catalyst for the reaction of the isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer. In addition, other additives, for example, solvents, flame proofing agents, plasticizers, cell regulators, and anti-agers may be added.

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Within the context of the invention, an "isocyanate prepolymer" is an oligomer containing reactive NCO groups which is involved as a pre-adduct in the formation of the polymer. (page 5 line 4-6.). Preferred prepolymers are formed by the reaction of isophorone diisocyanate or 2,4-tolylene diisocyanatotrimethylolpropane (page 5, lines 25-30). Polymer MDI which has a functionality of more than 2.3 and preferably in the range of 2.4 to 2.7 is useful in the practice of the invention (page 9 line 6-9). The reactive isocyanate-containing compounds based on MDI are characterized by a diisocyanate content of less than 20% by weight preferably less than 5% by weight, an NCO functionality of 2.7 to 5, and an NCO content of 26.0 to 30.0% by weight (page 11 lines 13-29).

Other polyisocyanates and isocyanate prepolymers are characterized by an isocyanate monomer content of less than 3% by weight, an NCO functionality of 2 to 5 and an NCO content of 8 to 30% by weight (page 11 lines 22-28).

The pressurized containers of the system of the invention contain 50 to 90 and preferably 60 to 85% by weight of an isocyanate compound, 0.1 to 5% by weight of catalyst, 5 to 35 and preferably 10 to 25% by weight of a blowing agent and 0.1 to 5% and preferably 0.5 to 3% of a foam stabilizer and up to 20 and preferably 3 to 15% by weight of a plasticizer. (Page 11 line 26 thru page 13 line 2). The composition can contain optional materials such as flame proofing agents in the amount of 2 to 50% by weight; other optional additives in an amount of 0.1 to 3% by weight can be in the composition (page 13 lines 3-5).

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Examples 1 presents a composition containing isocyanate prepolymers formed by reaction of a cyclotrimer with ethylene glycol. Examples 2-9 present compositions containing cyclotrimers of isophorone diisocyanate and hexane diisocyanate. The formation of low diisocyanate content polymer methylenediphenylisocyanate (MDI) by removal of diisocyanate and monoisocyanate compositions from a mixture is shown (Example 10), and foaming compositions containing the polymer MDI (10a and 10b) and a comparative example (10c) are shown. The foaming compositions are single component foaming compositions.

### ISSUES

1. Does a reference which discloses a container for dispensing a foamed isocyanate composition containing more than 5% monomer, from which virtually all of the prepolymer is expelled, in combination with references which disclose an isocyanate prepolymer formed from a diisocyanate monomer and a polyhydroxy compound with a diisocyanate content below 2% by weight and an NCO group content above 8% by weight make the present invention obvious?

2. Does a combination of references which discloses a system for dispensing a foam containing more than 5% by weight diisocyanate monomer in combination with references which disclose isocyanate mixtures containing less than 5% by weight diisocyanate monomers used in non foamed applications make the invention obvious?

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3. Does a composition which cannot be used to make a foamed plastic, due to its being a solid at the dispensing temperature, in combination with Pauls, make the present invention obvious?

4. Is the combination of references proper?

#### GROUPING OF THE CLAIMS

The claims do not stand or fall together. Each claim must be considered individually.

#### ARGUMENT

The invention is a system for the production of plastic foam. The system comprises: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or polyisocyanate prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of plastic foam from the disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5% by weight, based on the residual contents of the emptied container. The system also can include a polyisocyanate or isocyanate prepolymer with a diisocyanate monomer content less than 3% by weight based on the prepolymer, an NCO functionality of 2 to 5, and an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa · s at 25°C.

The low content of diisocyanate monomer in the container after the foam has

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been expelled can be achieved as follows:

1. Using low diisocyanate monomer content prepolymer which must contain 8-30% by weight NCO groups.
2. Introducing a trimerization catalyst into the pressurized container immediately before or after the contents are released from the container.
3. Introducing an OH containing compound into the pressurized container immediately before or immediately after the contents are removed from the container.
4. Using a cyclotrimer with a low diisocyanate content as the prepolymer.
5. Using polymer MDI with a low diisocyanate content as the prepolymer.

The system of the invention comprises a disposable pressurized container containing a composition having an NCO content of from about 8 to 30% by weight, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer.

The polyisocyanate or polyisocyanate prepolymer must have an NCO content of from about 8 to about 30% by weight based on the weight of the prepolymer. The high NCO content is required to permit the foam composition to cure rapidly so that the foam does not collapse before the cell walls are stabilized to the required extent to support the foam.

The container must also contain at least one catalyst for the reaction of the isocyanate group with an OH group. This is required to permit the foam to polymerize at a rate sufficiently rapid to stabilize the walls of the foam cells before the foam

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collapses.

The system of the invention also requires the presence of a blowing agent to form the foam when the contents of the container under pressure are released.

The composition of the present invention must also contain a foam stabilizer, which provides a foam with the required cell size.

All of the components must be present in the composition for it to effectively function as a system for producing a foam. Other optional ingredients can be incorporated in the composition but the polyisocyanate or isocyanate prepolymer having an NCO content of from about 8 to about 30% by weight of the prepolymer, the catalyst, blowing agent and foam stabilizer are critical to the composition. Appellants submit that the prior art cited by the Examiner neither teaches nor suggests the present invention.

The claims stand rejected under 35 U.S.C. §103(a) as obvious over Pauls. (U.S. 4,263,412) in view of Schmalstieg et al. (CA 2084698; herein after noted as Canada) and Minato et al. (U.S. 5,086,175). Appellants respectfully submit that the references whether considered alone or in combination neither teach nor suggest the present invention.

Pauls is related to the prior art disclosed by applicants. Pauls discloses a system for dispensing one component polyurethane foam from a container in which the foaming components are separated by a flexible membrane from the propelling gas. The device has the advantage that only a small amount of the foaming agent is required. The small amount of foaming agent permits selection from a broader range of

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foaming agents since certain useful foaming agents are soluble to only a limited extent in one component systems. Pauls represents the prior art cited by applicants.

Pauls teaches that the components which react to form the isocyanate component of the mixture are introduced into the container and reacted therein (see examples 1 to 27, column 7 lines 54, 55 and column 8 lines 25-29). A less preferred method is to react the isocyanate forming components in a kettle and pack the reaction mixture from the kettle into the container. As is known in the prior art, since the ratio of NCO groups to OH groups is preferably from 4 to 8, the amount of unreacted diisocyanate monomer in the contents of the container is high (greater than 5% by weight of the isocyanate component).

The large amount of unreacted diisocyanate monomer in the contents of the Pauls container presents no problem; since at column 7, lines 61-65, Pauls teaches:

"The inner container (1), the special shape of which permits virtually complete expulsion of the foamable prepolymer mixture containing isocyanate groups, consists either of aluminum or a resilient plastic, e.g., high pressure polyethelene." (Emphasis added by appellants.)

Appellants submit that since the Pauls device permits virtually complete expulsion of the foamable prepolymer mixture containing diisocyanate monomer from the container, there is no incentive to reduce the content of diisocyanate monomer in the contents of the container to ease waste disposal. Since Pauls teaches that the



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preferred method of filling the container is by reacting the components in the container of the system or in a separate container then filling the system, which methods produce a foaming composition with a high concentration of diisocyanate monomer, applicants submit that Pauls is not concerned with the high concentration of monomer in the contents of the container since the container is virtually emptied due to its unique design and little monomer or prepolymer remains in the container after the foaming composition is expelled. There is no concern with a high monomer content in the foaming composition since little foaming composition remains in the container after use.

There is no suggestion in Pauls to use a low monomer content foaming composition or a composition which has a low monomer content after the system is used.

The deficiencies in the teaching of Pauls are not cured by combination with Canada and Minato et al. Canada and Minato et al. disclose isocyanate-containing compositions having a low content of diisocyanate monomers which are useful for lacquers and adhesives. As set forth in the references, Canada and Minato et al. teach that a prepolymer is prepared using an excess of the diisocyanate monomer and the excess unreacted diisocyanate monomer is removed from the reaction mixture by a distillation process. The amount of unreacted diisocyanate monomer in the composition can be less than 0.1% by weight of the composition (see Canada). However, the composition with the low content of unreacted diisocyanate is expensive to produce. One skilled in the art would have no incentive to include such an expensive

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material in the formulation used in the container of Pauls. The Pauls container permits virtually complete expulsion of the foamable prepolymer mixture and therefore the empty container does not present a disposal problem.

The Canada reference is not pertinent to the present invention. The Canada polyisocyanate is a solid material and would not produce an adequate foam and could be dispensed from the container only with difficulty. The isocyanate prepolymer or polymer must be a liquid material if the process of the present invention is to be operable. Appellants submit that the solid nature of the polyisocyanate of Canada would discourage its use in the system of the invention. The composition of Canada is specifically developed to be soluble in certain solvents to be useful as a lacquer or coating composition.

Nowhere in the teachings of Canada and Minato et al. is there any suggestion that the polyisocyanate would be useful in a foaming application. The Minato et al. composition was developed to be soluble in nonpolar solvents so that effective lacquer formulations could be made. The composition is particularly useful in a two package coating system. Canada discloses solid polyisocyanates which are useful in lacquer formulations. The polyisocyanates of Canada are generally dissolved in a solvent. Since it is preferred that the system of the present invention is a one component system and does not contain a solvent, Applicants submit that Canada neither teaches nor suggest the present invention.

As shown by the examples, the composition of Canada would not be useful as a

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one shot foaming material due to its long drying time (13 hours). In addition, since the prepolymers are solids, they would not be useful in the practice of the present invention.

Appellants submit that as disclosed in Canada and Minato et al., it is known in the art to prepare polyisocyanate containing compositions with a low content of diisocyanate monomer. However, these compositions are known for use in lacquers or adhesives. Lacquers and adhesives are relatively expensive materials which can afford the extra process steps in preparing the low diisocyanate monomer material. However, there would be no incentive for one skilled in the art to include the expensive low diisocyanate content material in a system for forming a foamed resin comprising the container of Pauls from which virtually all of the contents are expelled, to reduce the expense of disposing of the container.

Appellants respectfully submit that the rejection over the combination of Pauls in view of Canada and Minato et al. is improper. To formulate a rejection over a combination of references there must be some suggestion in the references to make the combination. As discussed above, the only suggestion to combine the teachings of the references is in the present application. Clearly, one skilled in the art would not be led to include a low diisocyanate monomer content prepolymer in the container of Pauls, since the single component foaming mixture is virtually completely expelled from the container and the empty container would not present a disposal problem. Appellants therefore submit that the rejection is improper and request that it be

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reversed.

Appellants have provided a novel and unobvious system for providing a plastic foam. The system has a major unrecognized advantage in disposal of the empty container. Applicants submit that the prior art cited by the examiner provides no teaching or suggestion of the system of the invention. Pauls teaches the known system for forming foams; Canada and Minato et al. discloses low monomer content materials used for coatings and adhesives. There is no suggestion or incentive to combine the teachings of the references.

The combination of Pauls with Canada and Minato et al. is deficient in teaching or suggesting that isocyanates or polymeric MDI be utilized as the polyisocyanate in a one component polyurethane foam forming system. There is no teaching or suggestion that isocyanates and polymeric MDI are suitable foaming agents for one component foam systems.

In view of the above, appellants submit that the present invention is neither taught nor suggested by the combination of Pauls, Canada and Minato et al. and request that the Examiner's rejection be reversed.

Appellants also submit that use of a low diisocyanate monomer content prepolymer is only one possible solution to the problem, provided by the system of the present invention.

Disposable containers for generating foam plastic are known. However, the prepolymers utilized in the known systems were formed by mixing a large excess of the

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diisocyanate with OH terminated diols in the container to form a useful prepolymer.

However, since the compositions require a large stoichiometric excess of the diisocyanate, the compositions contain high concentrations of unreacted diisocyanate monomer. The present invention provides a method for forming a system which provides for residues with low monomer content in the pressurized container after use. The container can be designed to introduce an isocyanate cyclotrimer catalyst into the composition immediately before, during or after the contents have been removed from the container or introducing a low molecular weight alcohol into the container after the foam producing contents have been expelled from the container. Trimerization catalyst or the alcohol provide reactions which remove the diisocyanate monomer from contents of the container.

Systems for producing foamed plastics from pressurized containers were well known at the time the present invention was made. However, the systems were not concerned with residual amounts of unreacted diisocyanates in the pressurized container. The systems all contained substantial amounts of unreacted diisocyanate monomer in the container or the container was designed to expel substantially the entire contents of pressurized container so that there was little or not diisocyanate monomer remaining in the pressurized container.

#### PATENTABILITY OF THE CLAIMS

Claim 15 is patentable over the combination of references since there is neither

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teaching nor suggestion of a disposable pressurized container for forming a foam containing a polyisocyanate or isocyanate prepolymer having an NCO content of from 8% to 30% by weight based on the prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, which contains less than 5% by weight of an isocyanate monomer one day after the container is emptied. The compositions disclosed in Pauls contain more than 5% by weight isocyanate monomer and the compositions of Canada and Minato et al. are not disclosed or suggested as useful for foams. There is no suggestion to combine the references.

Claim 16 is patentable over the combination of references since the combination of references neither teaches nor suggests the system of claim 15 wherein the residue has diisocyanate monomer content of less than 2% by weight based on the total contents of the container after use nor suggests that it would be useful to provide such a system.

Claim 17 is patentable over the combination of references since there is neither teaching nor suggestion of a composition comprising the isocyanate polymer or prepolymer, catalyst, blowing agent and foam stabilizer with a diisocyanate monomer content less than 2% by weight based on the total contents of the container before application of the composition. There is neither teaching or suggestion to combine the lacquer components of Canada or Minato et al. with the composition and container of Pauls.

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Claims 18, 19, 20 and 21 are patentable over the combination of references since there is neither teaching nor suggestion of a system as claimed in claim 15 containing isocyanate polymer or prepolymer having from 8 to 30% by weight of NCO groups, based on the weight of the prepolymer, and a diisocyanate monomer content within the ranges set forth in claims 18-21.

Claim 22 is not obvious over the combination of references since there is neither teaching nor suggestion of the system containing a polyisocyanate or isocyanate prepolymer with an NCO content of 8 to 30% by weight based on the weight of the prepolymer with a viscosity of 5 to 200 Pa · s at 25° centigrade produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and /or aromatic diisocyanates containing 8 to 20 carbon atoms and a diisocyanate monomer content of less than 3% by weight based on the prepolymer.

Claim 23 is patentable over the teachings of the combination of references since there is neither teaching nor suggestion of the system of the invention wherein the prepolymer with the low NCO content be a cyclotrimer of a diisocyanate. Isocyanates are known but until the present invention had not been applied to one shot foaming system.

Claim 24 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein the prepolymer is a cyclotrimer of hexamethylene diisocyanate, isophorone diisocyanate and mixed trimers

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of hexamethylene diisocyanate and isophorone diisocyanate. These isocyanates had never been applied to foaming systems before the present invention.

Claim 25 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein an isocyanate prepolymer is a prepolymer of diisocyanates or isocyanurates with polyols and containing from 8 to 30% by weight of the prepolymer of NCO groups.

Claim 26 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention containing a prepolymer containing from 8 to 30% by weight of NCO groups based on the weight of the prepolymer wherein the prepolymer is produced from diisocyanates with NCO groups differing in their reactivity.

Claim 27 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the present invention comprising a pressurized container containing from 50 to 90% by weight of at least one polyisocyanate or isocyanate prepolymer containing from 8 to 30% by weight of the prepolymer of NCO groups, 0.1 to 5% by weight of a catalyst for reaction of the isocyanate groups with OH groups, 5 to 35% by weight of a blowing agent and 0.1 to 5% by weight of a foam stabilizer which after the container is empty contains less than 5% by weight of the contents of the container of diisocyanate monomer.

Claim 28 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising a polyisocyanate or



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isocyanate prepolymer containing from 26 to 30% by weight based on the weight of the prepolymer of NCO groups, a functionality greater than 2.7 wherein the prepolymer is formed from technical MDI by removal of a portion of diisocyanatodiphenylmethane. MDI prepolymer had not been applied to one component foaming system before the present invention.

Claim 29 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising use of polymer MDI or a polymer MDI prepolymer with an NCO content of from 26 to 30% by weight of the prepolymer.

Claim 30 is patentable over the combination of references since there is neither teaching nor suggestion of the system claimed in claim 29 where the polymer MDI prepolymer is formed by reaction of MDI with a diol containing 2 to 6 carbon atoms.

Claim 31 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention whereby the system comprises polymer MDI or polymer MDI prepolymer having from 26 to 30% by weight of NCO groups wherein up to 50% by weight of the polymer MDI or polymer MDI prepolymer is replaced by at least one member selected from a group consisting of low-monomer NCO prepolymers of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms.

Claim 32 is patentable over the combination of references since there is neither

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teaching nor suggestion of the system of the invention for replacing a portion of the polymer MDI or polymer MDI prepolymer to produce moisture-curing foams differing in their hardness and elasticity.

Claim 33 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising the composition disclosed in claim 33 wherein the polymer MDI or polymer MDI prepolymer has an NCO content of from 26 to 30% by weight of the prepolymer.

Claim 34 is patentable over the combination of references since there is neither teaching nor suggestion of the one-component foam plastic produced by the system of the present invention.

Claim 35 is patentable over the combination of references since there is neither teaching nor suggestion of the one-component foam plastic of the system of the invention used as an insulating or assembly foam.

Claim 36 is patentable over the combination of references since the combination of references is silent concerning a one-component foam plastic formed in situ by the system of the invention.

Claim 40 is patentable over the combination of references since there is no teaching nor suggestion of a composition comprising at least one polyisocyanate or isocyanate prepolymer having an NCO content of from 8 to about 30% by weight based on the weight of the prepolymer, a catalyst for the reaction of the isocyanate group and an OH group, a blowing agent and a foam stabilizer and providing the residue in the

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spent container as claimed.

Claim 41 is patentable over the combination of references since there is neither teaching nor suggestion of the composition of Claim 40 having residue with a diisocyanate monomer content of less than 2% by weight based on the total weight of the contents of the container.

Claim 42 is patentable over the combination of references since there is neither teaching nor suggestion of a composition wherein the diisocyanate monomer content is less than 2% by weight based on the total contents of the container before its application and the isocyanate polymer or isocyanate polymer prepolymer contains from 8 to 30% by weight of NCO groups by weight of the prepolymer.

Claim 43 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for use in the system of the invention containing isocyanate polymer or isocyanate polymer prepolymer containing from 8 to 30% by weight of NCO groups in the composition having less than 1% by weight diisocyanate monomer based on the weight of the composition.

Claim 44 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for the system of the invention containing less than 1.0% by weight of diisocyanate monomer before the foam issues from the container.

Claim 45 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for use in the system of the invention

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comprising isocyanate polymers or isocyanate polymer prepolymers containing from 26 to 30% by weight of NCO groups, catalysts, foaming agents, foam stabilizers wherein the diisocyanate monomer content of the composition is less than 0.5% by weight.

Claim 46 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention comprising a composition containing the catalyst, foaming agent, foam stabilizer and an isocyanate polymer or isocyanate prepolymer having from 8% to 30% by weight of NCO groups and less than 0.5% by weight of diisocyanate monomer, based on the total contents of the composition before application of composition from the disposable pressurized container.

Claim 47 is patentable over the combination of references since there is neither teaching nor suggestion of a composition for forming a foam plastic from the disposable pressurized container system of the invention wherein the polyisocyanate or isocyanate prepolymer has a diisocyanate monomer content of less than 3% by weight based on the weight of the prepolymer, an NCO functionality of 2 to 5, NCO content of 8 to 30% by weight based on the weight of the prepolymer, a viscosity from 5 to 200 Pa·s at 25° centigrade wherein the prepolymer is produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and/or aromatic diisocyanates containing 8 to 20 carbon atoms each with a boiling point not higher than 180°C at 10 mbar.

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Claim 48 is patentable over the combination of references since there is neither teaching nor suggestion of use of an isocyanate prepolymer which is a cyclotrimer of a diisocyanate in the system of the invention.

Claim 49 is patentable over the combination of references since there is neither teaching nor suggestion of a composition wherein the isocyanate is a polymer selected from the group consisting of cyclotrimers of hexamethylene diisocyanate, cyclotrimers of isophorone diisocyanate and mixed trimers thereof for use in the system of the invention.

Claim 50 is patentable over the combination of references since there is neither teaching nor suggestion of the polymer isocyanate prepolymer formed from diisocyanate or polyisocyanate and polyols for use in the system of the invention.

Claim 51 is patentable over the combination of references since there is neither teaching nor suggestion for forming the isocyanate prepolymers from diisocyanates containing NCO groups with different reactivities to achieve a low diisocyanate monomer content for the system of the invention..

Claim 52 is patentable over the combination of references since there is neither teaching nor suggestion of the composition containing 50 to 90% by weight of the polyisocyanate or isocyanate prepolymer, 0.1 to 5% by weight of a catalyst, 5 to 35% by weight of blowing agent and 0.1 to 5% by weight of a foam stabilizer wherein the polyisocyanate or isocyanate prepolymer has an NCO content of from 8 to 30% by weight of the prepolymer for use in the system of the invention.

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Claim 53 is patentable over the combination of references since the references are completely silent concerning polyisocyanates or isocyanate prepolymer formed from polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight based on the polymer-MDI, an average NCO functionality greater than 2.7, an NCO content of 26 to 30% by weight based on the polymer-MDI with a viscosity of 5 to 2000 Pa · s at 25° centigrade a polymer-MDI obtained from technical MDI with an average functionality greater than 2.3 by removal of diisocyanatodiphenylmethane for use in the system of the invention.

Claim 54 is patentable over the combination of references since there is neither teaching nor suggestion of the composition wherein at least one polymer MDI or polymer-MDI prepolymer is a prepolymer formed from a polymer-MDI and a polyol for use in the system of the invention.

Claim 55 is patentable over the combination of references since there is neither teaching nor suggestion of the composition wherein the polyol is a diol containing 2 to 6 carbon atoms for use in the system of the invention.

Claim 56 is patentable over the combination of references since there is neither teaching nor suggestion of a polymer-MDI or polymer-MDI prepolymer containing at least one low-monomer NCO prepolymer comprising residues of at least one member selected from the group consisting of hexamethylene diisocyanate, tolylene-2,6-isocyanate, isophorone diisocyanate, diphenylmethane 4,4'-diisocyanate and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms for use in the

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system of the invention.

Claim 57 is patentable over the combination of references since there is neither teaching nor suggestion that replacing a portion of the polymer MDI or polymer MDI prepolymer produces moisture-curing foams differing in their hardness and elasticity.

Claim 58 is patentable over the combination of references since there is neither teaching nor suggestion of the composition of claim 58 wherein the polymer MDI or polymer MDI prepolymer contains from 26 to 30% by weight of NCO groups and the remaining components of the composition.

Claim 59 is patentable over the combination of references since there is neither teaching nor suggestion of cured foam plastic of the invention.

Claim 60 is patentable over the combination of references since there is neither teaching nor suggestion concerning foam plastics of the system of the invention and their possible use as an insulating or assembly material.

Claim 61 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention and one-component foamed plastic used in situ which has the composition set forth in claim 40.

Claim 62 is patentable over the combination of references since there is neither teaching nor suggestion of a two-component foam plastic obtained from the compositions claimed in claim 40 by reaction of the composition thereof and a polyol.

Claim 63 is patentable over the combination of references since there is neither teaching nor suggestion for using the two-component foam plastic of claim 62 as an

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insulating or assembly foam.

Claim 64 is patentable over the combination of references since the combination of references neither teaches nor suggests a two-component foam plastic used in situ formed from the composition of claim 40 for use in the system of the invention.

Claim 65 is patentable over the combination of references since there is neither teaching nor suggestion of a composition having an NCO group content of from 8 to 30% by weight and wherein the at least one polyisocyanate or isocyanate prepolymer with the low diisocyanate monomer content is obtained by distilling the diisocyanate monomer from the polyisocyanate or isocyanate prepolymer.

Claim 66 is patentable over the combination of references since there is neither teaching nor suggestion of the system of the invention wherein a trimerization catalyst is introduced into the composition in the container immediately before or after the foam is released from the container.

Claim 67 is patentable over the combination of references since there is neither teaching nor suggestion of the system of claim 15 wherein the diisocyanate monomers are reacted with an OH compound added to the composition in the disposable pressurized container after a foaming period.

Claim 68 is patentable over the combination of references since there is neither teaching nor suggestion of the system of claim 15 wherein a monohydroxy alcohol is added to the composition remaining in the disposable pressurized container of the system after the foam is released.



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Appellants respectfully submit that the claims in the present application are neither anticipated nor obvious over the teachings the combination of Pauls, Canada and Minato et al. whether they are considered alone or in combination since they neither teach nor suggest:

1. A system which comprises a pressurized container, a particular isocyanate polymer or isocyanate polymer prepolymer having from 8 to 30% by weight of NCO groups based on the weight of the prepolymer, a catalyst for a reaction with an OH compound, a foaming agent, and a foam stabilizer and having a diisocyanate monomer content less than 5% by weight of the contents of the container one day after the container is emptied.
2. An isocyanate polymer or isocyanate polymer prepolymer having an NCO content of 26 to 30% by weight of the prepolymer.
3. The system of the invention comprising prepolymers prepared from diisocyanate trimers or prepolymers prepared from the diisocyanate trimers having less than 5% by weight of diisocyanate monomer.
4. The system of the invention comprising polymer MDI or polymer MDI prepolymers as the foam forming material.

Appellants submit that a rejection of the claims in the present application based on the teachings of Pauls, Canada and Minato et al. is untenable and respectfully request that the Honorable Board of Appeals and Interference's reverse the Examiner.

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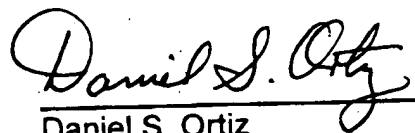
SUMMARY

Appellants respectfully request that the Examiner's final rejection be reversed for the following reasons:

1. The combination of Pauls in view of Canada and Minato et al. fails to teach or suggest the system of the invention.
2. The combination of Pauls in view of Canada and Minato et al. is improper since the only suggestion to combine the teaching of the references is in the present application.
3. The isocyanate product disclosed in Canada is not suitable for use as a material for forming a foam plastic since the isocyanate is a solid.

In view of the above discussion, Appellants respectfully request that the final rejection be reversed.

Respectfully submitted,



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APPENDIX

CLAIMS ON APPEAL

15. A system for the production of plastic foam comprising: a disposable pressurized container containing a composition comprising, at least one polyisocyanate or isocyanate prepolymer having an NCO content of from about 8% to about 30% by weight based on the prepolymer, at least one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of the plastic foam from said disposable pressurized container, the residue left in the pressurized container has a diisocyanate monomer content of less than 5.0% by weight, based on the residual contents of the emptied container.
16. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight based on the total contents of the container.
17. The system as claimed in claim 16 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.
18. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight based on the total contents of the container.
19. The system as claimed in claim 18 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight based on the total contents of the container before its application from said disposable pressurized container.

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20. The system as claimed in claim 15 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight based on the total contents of the container.

21. The system as claimed in claim 20 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight based on the total contents of the container before application of the composition from said disposable pressurized container.

22. The system as claimed in claim 15 wherein said composition contains, before its application from said disposable pressurized container, as said at least one polyisocyanate or isocyanate prepolymer, at least one isocyanate prepolymer with a diisocyanate monomer content of less than 3.0% by weight, based on the prepolymer, an NCO functionality of 2 to 5, an NCO content of 8 to 30% by weight, based on the prepolymer, and a viscosity of 5 to 200 Pa · s at 25°C, as measured in accordance with DIN 53015, the prepolymer having been produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and aromatic diisocyanates containing 8 to 20 carbon atoms, each with a boiling point not higher than 180°C at 10 mbar.

23. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a cyclotrimer of a diisocyanate.

24. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a cyclotrimer of a mixture of hexamethylene diisocyanate, isophorone diisocyanate, and mixed trimers thereof.

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25. The system as claimed in claim 22 wherein said at least one isocyanate prepolymer is a prepolymer of diisocyanates or isocyanurates containing NCO groups and polyols.

26. The system as claimed in claim 22 wherein said prepolymer has been produced from diisocyanates with NCO groups differing in their reactivity.

27. The system as claimed in claim 15 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polyisocyanate or isocyanate prepolymer,

0.1 to 5.0 % by weight of said catalyst,

5 to 35 % by weight of said blowing agent, and

0.1 to 5.0 % by weight of said foam stabilizer.

28. The system as claimed in claim 15 wherein said at least one polyisocyanate or isocyanate prepolymer is at least one polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight, based on the polymer-MDI, an average NCO functionality of greater than 2.7, an NCO content of 26.0 to 30.0% by weight, based on the polymer-MDI, and a viscosity of 5 to 2,000 Pa · s at 25°C according to DIN 53015, the polymer-MDI being obtained from technical MDI with an average functionality of greater than 2.3 by removal of a portion of the diisocyanatodiphenylmethane.

29. (Amended) The system as claimed in claim 28 wherein said at least one polymer-MDI or polymer-MDI prepolymer is a prepolymer of the polymer MDI and a polyol.

30. The system as claimed in claim 29 wherein said polyol is a diol containing 2 to 6 carbon atoms.

31. The system as claimed in claim 28 wherein up to 50% by weight of said at least one

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polymer-MDI or polymer-MDI prepolymer is replaced by at least one member selected from the group consisting of low-monomer NCO prepolymers of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate, and cyclotrimers of aliphatic diisocyanates containing 4 to 14 carbon atoms.

32. The system as claimed in claim 31 wherein said replacing produces moisture-curing foams differing in their hardness and elasticity.

33. The system as claimed in claim 28 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polymer-MDI or polymer-MDI prepolymer,

0.1 to 5.0 % by weight of the catalyst,

5 to 35 % by weight of the blowing agent, and

0.1 to 5.0 % by weight of the foam stabilizer.

34. A one-component foam plastic obtained from the system claimed in claim 15 by reaction of the composition thereof and moisture.

35. The method of using a one-component foam plastic as claimed in claim 34 wherein said one-component foam plastic is used as an insulating or assembly foam.

36. The method as claimed in claim 35 wherein said one-component foam plastic is used in situ.

40. A composition for the production of foam plastics from disposable pressurized containers comprising at least one polyisocyanate or isocyanate prepolymer having an NCO content of from about 8% to about 30% by weight based on the prepolymer, at least

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one catalyst for the reaction of an isocyanate group with an OH group, at least one blowing agent and at least one foam stabilizer, wherein not later than one day after application of the composition from said disposable pressurized container, the residue of said composition left in the pressurized container has a diisocyanate monomer content of less than 5.0% by weight, based on the residual contents of the emptied container.

41. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 2.0% by weight based on the total contents of the container.

42. The composition as claimed in claim 41 wherein the diisocyanate monomer content of said composition is less than 2.0% by weight by weight, based on the total contents of the container before application of the composition from said disposable pressurized container.

43. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 1.0% by weight based on the total contents of the container.

44. The composition as claimed in claim 43 wherein the diisocyanate monomer content of said composition is less than 1.0% by weight , based on the total contents of the container before application of the composition from said disposable pressurized container.

45. The composition as claimed in claim 40 wherein said composition has a diisocyanate monomer content of less than 0.5% by weight based on the total contents of the container.

46. The composition as claimed in claim 45 wherein the diisocyanate monomer content of said composition is less than 0.5% by weight , based on the total contents of the container before application of the composition from said disposable pressurized container.

47. The composition as claimed in claim 40 wherein said composition contains, before

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application from said disposable pressurized container, as said at least one polyisocyanate or isocyanate prepolymer, at least one isocyanate prepolymer with a diisocyanate monomer content of less than 3.0% by weight, based on the weight of the prepolymer, an NCO functionality of 2 to 5, an NCO content of 8 to 30% by weight, based on the weight of the prepolymer, and a viscosity of 5 to 200 Pa · s at 25°C, as measured in accordance with DIN 53015, the prepolymer having been produced from at least one diisocyanate selected from the group consisting of aliphatic diisocyanates containing 2 to 36 carbon atoms, cycloaliphatic diisocyanates containing 5 to 30 carbon atoms and aromatic diisocyanates containing 8 to 20 carbon atoms, each with a boiling point not higher than 180°C at 10 mbar.

48. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is a cyclotrimer of a diisocyanate.

49. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is at least one isocyanate prepolymer selected from the group consisting of cyclotrimer of hexamethylene diisocyanate, cyclotrimer of isophorone diisocyanate, and mixed trimers thereof.

50. The composition as claimed in claim 47 wherein said at least one isocyanate prepolymer is a prepolymer of at least one of diisocyanates and isocyanurates and polyols.

51. The composition as claimed in claim 47 wherein said prepolymer has been produced from diisocyanates with NCO groups differing in their reactivity.



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52. The composition as claimed in claim 40 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polyisocyanate or isocyanate prepolymer,

0.1 to 5.0 % by weight of said catalyst,

5 to 35 % by weight of said blowing agent, and

0.1 to 5.0 % by weight of said foam stabilizer.

53. The composition as claimed in claim 40 wherein said at least one polyisocyanate or isocyanate prepolymer is at least one polymer-MDI or polymer-MDI prepolymer with a diisocyanate monomer content of less than 20% by weight, based on the polymer-MDI, an average NCO functionality of greater than 2.7, an NCO content of 26.0 to 30.0% by weight, based on the polymer-MDI, and a viscosity of 5 to 2,000 Pa · s at 25°C according to DIN 53015, the polymer-MDI being obtained from technical MDI with an average functionality of greater than 2.3 by removal of the diisocyanatodiphenylmethane.

54. The composition as claimed in claim 53 wherein said at least one polymer-MDI or polymer-MDI prepolymer is a prepolymer of the polymer MDI and a polyol.

55. The composition as claimed in claim 54 wherein said polyol is a diol containing 2 to 6 carbon atoms.

56. The composition as claimed in claim 53 wherein up to 50% by weight of said at least one polymer-MDI or polymer-MDI prepolymer is replaced by at least one low-monomer NCO prepolymer comprising residues of at least one member selected from the group consisting of hexamethylene diisocyanate, tolylene-2,6-diisocyanate, isophorone diisocyanate, diphenylmethane-4,4'-diisocyanate, and cyclotrimers of aliphatic

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diisocyanates containing 4 to 14 carbon atoms.

57. The composition as claimed in claim 56 wherein said replacing produces moisture-curing foams differing in their hardness and elasticity.

58. The composition as claimed in claims 53 wherein said composition is comprised of:

50 to 90 % by weight of said at least one polymer-MDI or polymer-MDI prepolymer,

0.1 to 5.0 % by weight of the catalyst,

5 to 35 % by weight of the blowing agent, and

0.1 to 5.0 % by weight of the foam stabilizer.

59. A one-component foam plastic obtained from the composition claimed in claim 40 by reaction of the composition thereof and moisture.

60. The method of using a one-component foam plastic as claimed in claim 59 wherein said one-component foam plastic is used as an insulating or assembly foam.

61. The method as claimed in claim 60 wherein said one-component foam plastic is used in situ.

62. A two-component foam plastic obtained from the composition claimed in claim 40 by reaction of the composition thereof as a first component and a polyol as a second component.

63. The method of using a two-component foam plastic as claimed in claim 62 wherein said two-component foam plastic is used as an insulating or assembly foam.

64. The method as claimed in claim 63 wherein said two-component foam plastic is used in situ.

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65. A method of producing the system as claimed in claim 15 wherein diisocyanate is distilled from said at least one polyisocyanate or isocyanate prepolymer.

66. A method of producing the system as claimed in claim 15 wherein diisocyanate monomers are polymerized by addition of trimerization catalysts immediately before or after foaming.

67. A method of producing the system as claimed in claim 15 wherein diisocyanate monomers are reacted with an OH compound added to the composition remaining in the disposable pressurized container after foaming.

68. The method as claimed in claim 67 wherein said OH compound is a monoalcohol.